

FORM PTO 1390 (REV 11-2000)		DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NO. 970054.410USPC
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Unknown 10/019604
INTERNATIONAL APPLICATION NO. PCT/EP00/02158	INTERNATIONAL FILING DATE 11 March 2000 (11.03.2000)	PRIORITY DATE CLAIMED 30 June 1999 (30.06.1999)	
TITLE OF INVENTION WIND POWER PLANT PROVIDED WITH CAST SHADOW CONTROL			
APPLICANT(S) FOR DO/EO/US WOBLEN, Alloys			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). <input checked="" type="checkbox"/> has been communicated by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <input type="checkbox"/> is attached hereto <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ol style="list-style-type: none"> <input checked="" type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> have been communicated by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 			
Items 11 to 20 below concern document(s) or information included:			
<ol style="list-style-type: none"> <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4) <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). <input type="checkbox"/> Other items of information: 			

U.S. APPLICATION NO. <u>10/019604</u> Unknown	INTERNATIONAL APPLICATION NO. PCT/EP00/02158	ATTORNEY'S DOCKET NUMBER 970054.410USPC
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21. ☒ The following fees are submitted:

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO.....\$1040.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....\$890.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4).....\$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4).....\$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT	=	\$890.00
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		\$130.00

Claims	Number Filed	Number Extra	Rate
Total Claims	9 - 20 =	0	x \$ 18.00
Independent Claims	6 - 3 =	3	x \$ 84.00
Multiple dependent claim(s) (if applicable)			+ \$280.00

TOTAL OF ABOVE CALCULATIONS	=	\$1272.00
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.		\$0.00
SUBTOTAL	=	\$1272.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		\$130.00
TOTAL NATIONAL FEE	=	\$1402.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.		\$0.00
TOTAL FEES ENCLOSED	=	\$1402.00
		Amount to be refunded: charged

a. ☒ A check in the amount of \$1402.00 cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.

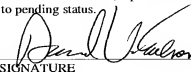
c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **19-1090**. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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Wind power installation with shadow casting regulation

- In the planning and erection of wind power installations the visual impairments to be expected of the wind power installation on the environment are playing an increasingly important part in terms of approval and acceptance. If for example a wind power installation is
- 5 positioned in the proximity of a residential building, it is possible in adverse positions of the sun, that the wind power installation or the rotor thereof is between the sun and the residential building. If the sunshine is not affected by clouds the rotor as it rotates continuously casts a shadow thereof on the plot of land. The shadow projection caused by the wind
- 10 power installation on the adjacent area of ground is often perceived by the residents as being a very severe nuisance. Even if the wind power installation satisfies the requirements in terms of legal requirements for planning permission, there is however not always a guarantee that the unwanted shadow effect is prevented.
- 15 The object of the present invention is to provide a wind power installation by means of which the problems of casting shadows are overcome.

In accordance with the invention that object is attained by a method of operating a wind power installation as set forth in claim 1. Advantageous developments are set forth in the appendant claims.

The invention is based on the realisation that casting of shadows
5 can only occur in a given position of the sun, when the situation involves direct solar irradiation with a high level of light intensity. As is known, the position of the sun depends on the time of the year and the time of day, and can be ascertained by means of measurement or calculation programs for any relevant immission point (that is the location [region] at which
10 shadow casting can occur). Accordingly, the basis for shadow shut-down of a wind power installation are the calculated times in which a shadow casting effect can occur in relation to a neighbouring area (at the immission point), by virtue of the position of the sun and the geographical arrangement of the installation. In parallel with the predetermined times
15 related to the position of the sun, the light intensity is ascertained by way of a light sensor and thus the plausibility of a shadow-casting effect occurring is checked. It is only if, during the predetermined times in relation to the position of the sun, at which a shadow-casting effect at the immission point is possible, the level of brightness is sufficient to cause a
20 shadow to be cast, that the wind power installation shadow shut-down mode occurs.

Shadow shut-down can be implemented in the case of the wind power installation according to the invention by way of an input/display device (LC-display). For that purpose the settings or values of the current
25 and the shut-down light intensity can be read off. In addition, it is possible to ascertain from the display, the status which the shut-down procedure involves at the current time, that is to say, whether it is switched on or off, or is active or inactive. Input of the shut-down times can be predetermined or loaded, in a separate menu.

30 The "shadow shut-down" mode involves a display of the parameters comprising current light intensity (value in %), shadow shut-down light

intensity (value in %), shadow shut-down (on/off) or shadow shut-down (active/inactive). In that respect, the shut-down light intensity is a value in respect of the light intensity, at which the wind power installation is to be shut down. If for example a wind power installation is very close to an affected immission point, then even with a slightly cloud-covered sky, the shadow-casting effect which occurs is a nuisance. Therefore in that situation (the wind power installation is very close to the immission point in question) the installation should involve a lower value for the level of shut-down intensity, than the situation where the immission point is further away from the wind power installation. In regard to light intensities, a low percentage value denotes a low level of light intensity (for example when the sky is overcast) while a high percentage value denotes a strong light intensity (for example direct sunshine), which suggests that solar irradiation is not disturbed by the sky being overcast with cloud or by mist. Shadow shut-down (on/off) indicates whether that is activated at all. Shadow shut-down (active/inactive) specifies whether the installation is at the present time shut-down because a shadow is being cast.

If, for the current level of light intensity, a value above the shut-down light intensity is ascertained and if at the same time there is identity in the inputted time window which takes account of solar irradiation or the position of the sun, the wind power installation automatically stops if shadow shut-down is switched to "on". While the installation is stopped by virtue of a shadow being cast, a corresponding status message appears in the main menu of the display device.

The value of the shut-down light intensity can be altered by suitable inputs. As the shadow of the rotor blades becomes weaker with increasing distance in relation to the immission point and at some point becomes totally insignificant, the shadow-casting effect becomes detrimental, with increasing distance, only if a higher level of light intensity is involved. On average 60% can be fixed as a meaningfully set

value for the level of shut-down light intensity. The shut-down light intensity however has to be adjusted in accordance with respective local factors because the level of shut-down light intensity also depends on the geographical factors on site.

- 5 The light conditions are also continuously further measured after the installation stops. The wind power installation re-starts automatically if the level of light intensity is below the shut-down level for a duration of more than 2 minutes, preferably 10 minutes, or if the shadow has moved (by virtue of a change in the position of the sun or because of the path of
10 movement of the sun) to such an extent that the immission point is no longer suffering from adverse effects due to a shadow being cast.

- The times for occurrence of the shadow being cast are edited for input by way of a menu. In that respect the values are composed of a starting date and an end date, and a start time and a stop time. Inputted
15 values can be at any time altered, expanded or erased, and that can be effected by means of manual input or by reading in a suitable program.

 The times relating to the position of the sun are inputted in the format of winter time. Likewise leap years are taken into account in the programming.

- 20 The times for shadow shut-down can always be called up at the current time or subsequently, by way of remote monitoring, so that it is possible to implement verification for observation purposes.

 The invention is described in greater detail hereinafter by means of an embodiment.

- 25 Figure 1 shows a side view of the effect of casting shadow, at two different positions of the sun, and

 Figure 2 shows a plan view of the casting of shadow, also at two different positions of the sun.

- Figure 1 shows a wind power installation, for example of type E-40
30 from Enercon, which is at a given distance E from a house 2. The house 2 is also referred to as the immission point A.

When in the morning the sun rises or in the wintertime throughout the entire day, the sun – always as seen from the immission point A – only rises to a low height so that, at the position I of the sun, there is an angle of incidence βI .

5 If the sun rises higher – position II of the sun – that involves a different angle of incidence βII for the rays of the sun. Those angles of incidence βI and βII (any other angles of incidence are also possible) of the rays of the sun also establish when shadow can be cast directly at the immission point A.

10 The scenario shown in Figure 1 is shown once again in Figure 2 from a different perspective. When the sun (once again considered from the immission point) is in the South-East, the rays of the sun impinge on the wind power installation at an angle αI , in relation to the West-East axis.

15 As soon as the sun has moved further towards the South, the rays of the sun are incident on the wind power installation 1 at a different angle αII .

It is only if the position of the sun which is a function of the geographic location on the Earth and the angles of incidence α and β is
20 such that the shadow of the wind power installation is incident on the immission point A, that the wind power installation is shut down, if the level of light intensity at the immission point is above a predetermined value, more specifically a shut-down light intensity. The shut-down intensity depends not only on the incidence of light, but also the distance
25 in relation to the immission point. If a wind power installation is very close to the immission point affected, then the shadow-casting effect which occurs can be a nuisance, even when the sky is slightly covered with cloud. In such a situation therefore the wind power installation should involve a lower value for the shut-down intensity, than for the
30 situation where the immission point is further away from the wind power installation.

If the level of light intensity is below the shut-down intensity, the wind power installation – independently of the position of the sun – is not shut down and can continue to generate electrical energy. Such a situation occurs in particular when the sky is very cloudy.

- 5 The further away that a wind power installation is arranged from the immission point, the correspondingly shorter are the times within which a shadow-casting effect can occur at all at the immission point.

10 The level of light intensity can be measured directly at the immission point A or at the wind power installation. As the immission point and the wind power installation are relatively close together, the light intensity values measured for the wind power installation are also valid for the immission point A.

15 The level of light intensity itself can be measured for example with a light sensor whose values are processed by a data processing apparatus which is associated with the wind power installation. Also programmed in that data processing apparatus are the positions of the sun at which a shadow-casting effect can occur at the immission point. It is readily apparent that these "shadow-casting" positions of the sun are different for each wind power installation and therefore the data processing apparatus
20 has stored for each wind power installation a different position of the sun at which the shadow-casting effect can occur.

25 It will be appreciated that it is also possible that, in the case of a wind park arranged in the proximity of an immission point where shadow casting is to be avoided, control can be implemented by a central data processing apparatus which switches off respective individual wind power installations of the wind park when the wind power installations cause a shadow to be cast at the immission point.

30 If a shadow-casting effect occurs, the wind power installation is not shut down immediately, but only if the shadow-casting effect has occurred over a certain time, for example between 5 and 10 minutes.

When the shadow-casting effect no longer exists, for example because clouds have moved between the sun and the wind power installation, it can also be provided that the wind power installation is not started up again immediately, but instead there is a certain waiting time, 5 for example between 5 and 10 minutes, and the wind power installation is switched on and starts to run again, only when the level of light intensity was below the shut-down intensity, within that certain waiting time.

It is also possible, besides shut-down positions of the sun which have already been programmed, to program further positions of the sun 10 for the wind power installation, if that is necessary.

CLAIMS

1. A method of operating a wind power installation which shuts down at a predetermined position of the sun if the light intensity is above a predetermined value (shut-down intensity).

2. A method according to claim 1 characterised in that the wind power installation is shut down at least at times at a predetermined position of the sun.

3. A method according to claim 1 or claim 2 characterised in that the predetermined positions of the sun at which installation shut-down can be triggered are stored in the wind power installation or in a control and/or data processing apparatus associated therewith.

4. A method according to one of the preceding claims characterised in that the level of light intensity is detected by means of a light sensor and on the basis of the detected light intensity, by means of a data processing program, an evaluation is made as to whether there is at all a solar radiation effect which is sufficient to cause a shadow to be cast.

5. A wind power installation for carrying out the method according to one of the preceding claims comprising a data processing apparatus which controls the wind power installation and in which are stored the positions of the sun or values which are representative in relation thereto, at which shut-down of the installation can occur.

6. A wind power installation according to claim 5 characterised in that the wind power installation is coupled to a light sensor, by means of which the respectively current light intensity or the light intensity as ascertained over a certain time is measured, and that the data ascertained by the light sensor are processed by the data processing apparatus and

wind power installation shut-down takes place if when a predetermined position of the sun occurs, the light intensity is above a predetermined value at which it is to be expected that the wind power installation casts a shadow.

7. A wind power installation according to one of the preceding claims characterised in that the installation has a display device, by means of which the status of shadow shut-down can be reproduced.

8. A wind power installation according to one of the preceding claims characterised in that besides the stored positions of the sun, it is possible to store new positions of the sun, for further immission points, which is implemented by means of suitable programming.

9. A wind park having a plurality of wind power installations according to one of the preceding claims.

Abstract

In the planning and erection of wind power installations the visual impairments to be expected of the wind power installation on the environment are playing an increasingly important part in terms of approval and acceptance. If for example a wind power installation is positioned in the proximity of a residential building, it is possible in adverse positions of the sun, that the wind power installation or the rotor thereof is between the sun and the residential building. If the sunshine is not affected by clouds the rotor as it rotates continuously casts a shadow thereof on the plot of land. The shadow projection caused by the wind power installation on the adjacent area of ground is often perceived by the residents as being a very severe nuisance. Even if the wind power installation satisfies the requirements in terms of legal requirements for planning permission, there is however not always a guarantee that the unwanted shadow effect is prevented.

The object of the present invention is to provide a wind power installation by means of which the problems of casting shadows are overcome.

1. A method of operating a wind power installation which shuts down at a predetermined position of the sun if the light intensity is above a predetermined value (shut-down intensity).

(Figure 1)

1/2

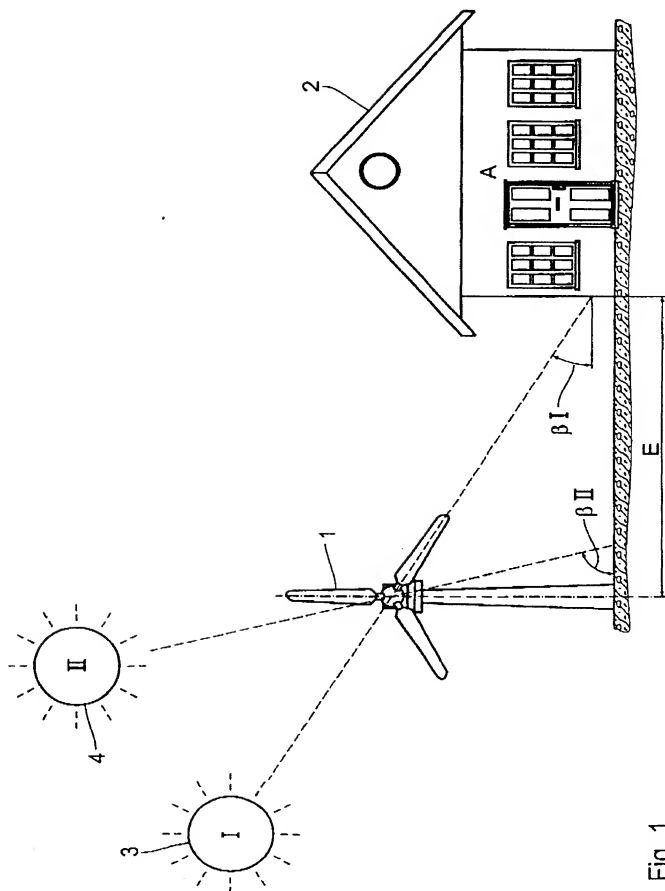


Fig. 1

2/2

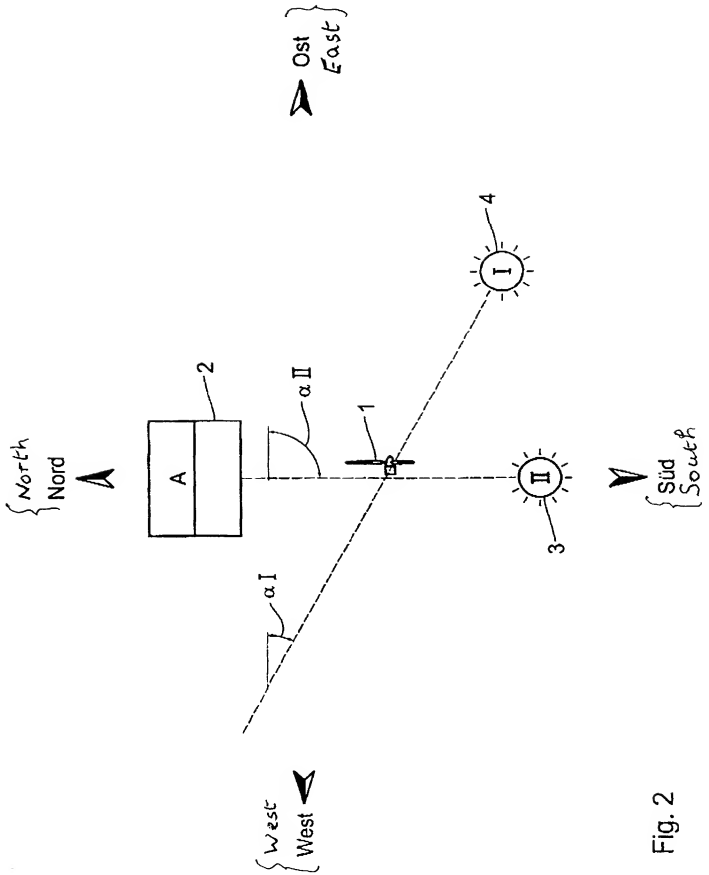


Fig. 2

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PTO/SB/81 (10-00)

Approved for use through 10/31/2002 OMB 0651-0035

U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

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ELECTION AND POWER OF ATTORNEY OR AUTHORIZATION OF AGENT	Application Number	10/019,604
	Filing Date	
	First Named Inventor	Aloys Wobben
	Group Art Unit	Not yet known
	Examiner Name	Not yet known
	Attorney Docket Number	970054.410USPC

I hereby appoint:

☒ Practitioners at Seed IP Law Group PLLC

OR

☐ Practitioner(s) named below:



Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the Patent and Trademark Office connected therewith.

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I am the

☒ Applicant/Inventor.

Assignee of record of the entire interest See 37 CFR 3.71.

Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

As assignee of record of the entire interest hereby elect, under 37 C.F.R. § 3.71, to prosecute the application to the exclusion of the inventor

SIGNATURE of Applicant or Assignee of Record

Name	Aloys Wobben
Signature	<i>Aloys Wobben</i>
Date	17 April 2002

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*

☒ *Total of 2 forms are submitted

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**DECLARATION FOR
UTILITY OR DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☐ Declaration Submitted
with Initial Filing

☒ Declaration Submitted
after Initial Filing

Attorney Docket No.	970054.410USPC
First Named Inventor	Aloys Wobben
COMPLETE IF KNOWN	
Application Number	10/019,604
Filing Date	
Group Art Unit	Not yet known
Examiner's Name	Not yet known

As the below named inventor(s), I/we hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

WIND POWER PLANT PROVIDED WITH CAST SHADOW CONTROL

(Title of invention)

the specification of which was filed on (MM/DD/YYYY)

March 11, 2000

the specification of which is attached
hereto

as United States Application Number or PCT
International Application Number

PCT/EP00/02158

Express Mail
No

and was amended on (MM/DD/YYYY) (if applicable)

I/we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

In addition, I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application, if applicable.

I/we hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Claimed	Certified Copy Attached? YES	NO
19929970.6	DE	June 30, 1999	Y		X
PCT/EP00/02158	WO	March 11, 2000	Y		X

Additional foreign application numbers are not listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I/we hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application No.	Filing Date (MM/DD/YYYY)	Application No.	Filing Date (MM/DD/YYYY)

Additional provisional application numbers are not listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

Direct all communications to Customer Number **00500**

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I/we hereby declare that all statements made herein of my/our own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature			Date		
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Inventor's Signature			Date		
Residence: City		State		Country	
Post Office Address					
City		State		Country	

Additional Inventor:					
Given Name (first and middle [if any])			Family Name or Surname		
Inventor's Signature			Date		
Residence: City		State		Country	
Post Office Address					
City		State		Country	